

Ayla Martinez

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Education

Northern Arizona University (Aug 2012- Dec 2016)

- Chemistry, Bachelor of Science - Advanced Emphasis (Instrumental Analysis, Biochemistry, and Inorganic Chemistry Capstones)
- Microbiology, Bachelor of Science (Emphasis is Microbial Ecology)
- Certificate in Biotechnology

Northern Arizona University (Aug 2018-present)

- Masters in Biological Sciences (Emphasis in Microbial Metabolism & Soil Biochemistry)

Experience

Research Assistant & Graduate Research Assistantship Work

Northern Arizona University Center for Ecosystem Science and Society

May 2017-August 2018 & August 2018-present

The study included a set of soil incubation experiments where differently labeled ^{13}C -isotopomers were added to soils containing ^{12}C - organic acids, amino acids, and sugars. With these additions, we sought to better understand biochemical pathways and catabolic rates in soil, compare known enzymatic regulation theory to soil communities, and determine if carbon use efficiency changes in the presence of multiple substrates. After the data is acquired, the goal of this research is to design a metabolic model to better describe soil microbial metabolism and compare it to cultured microbial communities. In addition, we are also studying metabolic changes in anaerobic marsh soils. We used two different soil types, had different soil moisture treatments, and isotopic labels to measure the soil community's respective metabolism.

Tasks:

- Designing experiments involving multiple substrates and isotope additions known to affect biochemical reactions in cultured organisms and compare these to soil microbial communities.
- Designing experiments involving anaerobic metabolism.
- Analysis of ^{13}C - CO_2 using the PICARRO gas spectrometer.
- Handling of compressed gasses to perform experimental procedures and ensure precision with the gas spectrometer.
- Performed data extraction, isotopic calculations, and statistical analysis on data.
- Analysis of data using a metabolic model and finding ways to improve this model by testing known biochemical reactions in the tricarboxylic acid cycle (TCA), pentose phosphate pathway (PPP), and anaplerotic pathways into the TCA cycle.
- Mathematically determined catabolic biochemical rates using data collected from experiments.

- Supervised/Trained undergraduate and graduate students: Showed them how to determine ^{13}C - CO_2 from soil sample headspace using the PICARRO gas spectrometer, helped them set up experiments and improve their experimental design, and showed students how to statistically analyze data.

Laboratory Technician

NAU Center for Ecosystem Science and Society

Aug 2016-May 2017

Helped determine the effects of endo and ecto mycorrhizae on acquisition of permafrost nitrogen for Alaskan tundra plants, determining root species and ecto mycorrhizae through microscopy, and quantitatively weighing ^{15}N isotopically labeled plant biomass and soil.

- Determined root species and ecto mycorrhizae through optical microscopy.
- Determined different plant tissue species.
- Quantitatively weighed ^{15}N isotopically labeled plant biomass and soil.
- Prepared standard solutions for analysis of ^{15}N isotopically labeled plant biomass and soil.

Volunteer Undergraduate Research in Arbuscular Mycorrhizae Fungus in Native Arizona Grasses

NAU Center for Ecosystem Science and Society

May 2016-Aug 2016

We evaluated associated impacts to belowground biomass and AM fungal colonization within heated, intact, and sterilized soil treatments. This work revealed that microbial inoculants may be best applied to C_4 species, particularly in areas that experience high climate stress.

Tasks:

- Quantified Roots from *Festuca arizonica* and Blue Gramma grass species
- Prepared and read slides for optical microscopy.
- Differentiated between AM (Arbuscular Mycorrhizae) and non AM fungi (Parasitic Fungi/endophytes)
- Prepared calculations and Excel Data Sheets and ran multiple linear regression statistics using the R studio programming software.

Biological Science Technician

TGen North

Jun 2016-Aug 2016

- Prepared Reagents and agar gels for electrophoresis.
- Some Experience in PCR purification using the Agencourt AMPure XP magnetic bead system.
- Diluted qPCR indexes and standards.
- Ran qPCR reactions: Bacterial and Fungal quantification, Library quantification, and DNA pooling.

Undergraduate Research in Global Environmental Change

NAU Center for Ecosystem Science and Society

May 2015-Dec 2015

The proposed study was set of incubation experiments where differently labeled isotopomers (glucose and pyruvate) were added to soil. $^{13}\text{CO}_2$ that was released from these isotopomers will be measured, and were used to determine how central carbon metabolic network reacts to different conditions. These conditions include a range of temperatures and temperature changes.

Tasks:

- Preparing the isotopic solutions.
- Handling of compressed gasses.
- Extracted microbial biomass from soil communities. Took Respiration and delta ^{13}C -data using the LICOR CO₂ Analyzer and the PICARRO (CO₂, CH₄, and H₂O) gas analyzer.
- Analyzed and prepped soil DNA with PowerSoil DNA isolation kits & quantified it with Qubit 1.0 Fluorometer.
- Calculated carbon usage efficiency with a metabolic model in excel.
- Data analysis.
- Set up soils in temperature incubations.

Laboratory Technician

NAU Center for Ecosystem Science and Society

Feb 2015-May 2015

- Used the autoclave to purify solids and liquids.
- Prepared stock chemical solutions.
- Refilled reagent bottles.
- Acid washed dishes and disposed of bio hazards accordingly.
- Performed calibration of equipment. o Chemical Inventory.
- Assisted in Potassium Sulfate and Chloroform Fumigations of soil communities.
- Assisted in prepping and analyzing PCR and qPCR.

Meta-analysis Research

NAU Center for Ecosystem Science and Society

May 2014-Sept 2014

- Extracted data from research articles using excel to investigate the effects CO₂ has on soil organic carbon (SOC), microbial biomass, Plant biomass, carbon turnover time and ecosystem fluxes.

Presentations:

Martinez, A., Johnson, N., Hungate, B., & Rubin, R. (2014, November). **The effects of soil heating on AM fungal colonization in two desert grasses.** Poster session presented at The American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America International Conference, Phoenix, AZ.

Skills & Languages:

Fluent in both Spanish and English.

Software:

Microsoft Word, Excel (Standard Deviation, Meta-analysis, Linear Regression Statistics, etc.), PowerPoint, R Studio Programming Software, MATLAB Programming Software.

Scientific Equipment:

- Picarro G2201-i CO₂ cavity ring-down isotope spectrometer LICOR CO2 Analyzer,
- Qubit 1.0 Fluorometer,
- PowerSoil DNA isolation kits
- Autoclave
- Optical/Light Microscopy
- Nano drop 2000 Spectrometer